Trial by Fire

Improving Our Ability to Reduce Wildfire Impacts to Sage-Grouse and Sagebrush Ecosystems Through Accelerated Partner Collaboration

By Tim Murphy, David E. Naugle, Randall Eardley, Jeremy D. Maestas, Tim Griffiths, Mike Pellant, and San J. Stiver

On the Ground

- Conservation partners across 11 western states are rallying in unprecedented fashion to reduce threats to sage-grouse and the sagebrush ecosystem they occupy.
- Improvements made in the Bureau of Land Management's (BLM) wildfire policy are a tremendous step forward but the 2012 wildfire season is a harsh reminder that more action is needed to improve our effectiveness in reducing impacts to sage-grouse.
- Challenges and opportunities presented here are intended to heighten awareness of the wildfire issue and to further accelerate a mutually agreed upon, spatially explicit path forward, so that all partners can quickly engage in its implementation.

Keywords: Great Basin, fuels management, landscape approach, partnerships, sage-grouse, cheatgrass, wildfire

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Partners across 11 western states are rallying in unprecedented fashion to reduce threats to greater sage-grouse (*Centrocercus urophasianus*) and the sagebrush ecosystem they occupy (Fig. 1). Actions are spurred by the March 2010 finding issued by U.S. Fish and Wildlife Service (FWS) that sage-grouse warrant protection under the federal Endangered Species Act (ESA), but are precluded until 2015 by higher priority actions.[1] The FWS identified two overarching factors

Already preventing 97-99% of wildfires from becoming large

Recent Wildfire Occurrence in Sage-Grouse Habitat (1992-2012)						
Fire Size (Acres)	< 1	< 10	< 100	< 1k	< 10k	> 10k
# of fires	17,838	8,742	3,819	2,202	939	242
Cumulative % of all fires	53%	79%	90%	97%	99%	100%

Data sources: NIFC; Short 2014

What to do about the 1-3%?

- Occurring under Extreme Fire Hazard conditions
- *The Perfect Storm* - High temperatures, high winds, low humidity, and multiple fire starts
- Example: 2012 fire season

Human nature:

Fight harder!

Fire Managers:

Help us 'compartmentalize' <u>before</u> fire

We lacked a mutually agreed upon strategic approach

USDA United States Department of Agriculture

Using Resistance and Resilience Concepts to Reduce Impacts of Invasive Annual Grasses and Altered Fire Regimes on the Sagebrush Ecosystem and Greater Sage-Grouse: A Strategic Multi-Scale Approach

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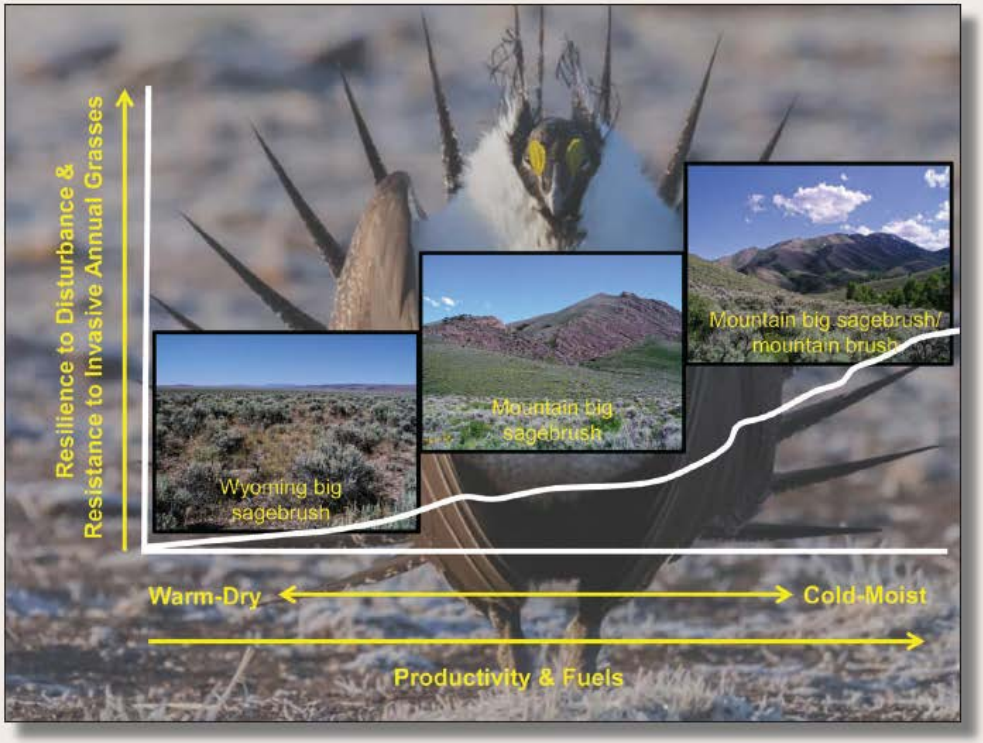

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RATIONALE FOR STRATEGIC APPROACH

FWS Conservation Objectives Team (2013)

Greater Sage-Grouse Management Objective ~

"the long-term conservation of sage-grouse and healthy sagebrush shrub and native perennial grass and forb communities by maintaining viable, connected, and well-distributed populations and habitats, through threat amelioration, conservation of key habitats, and restoration activities."

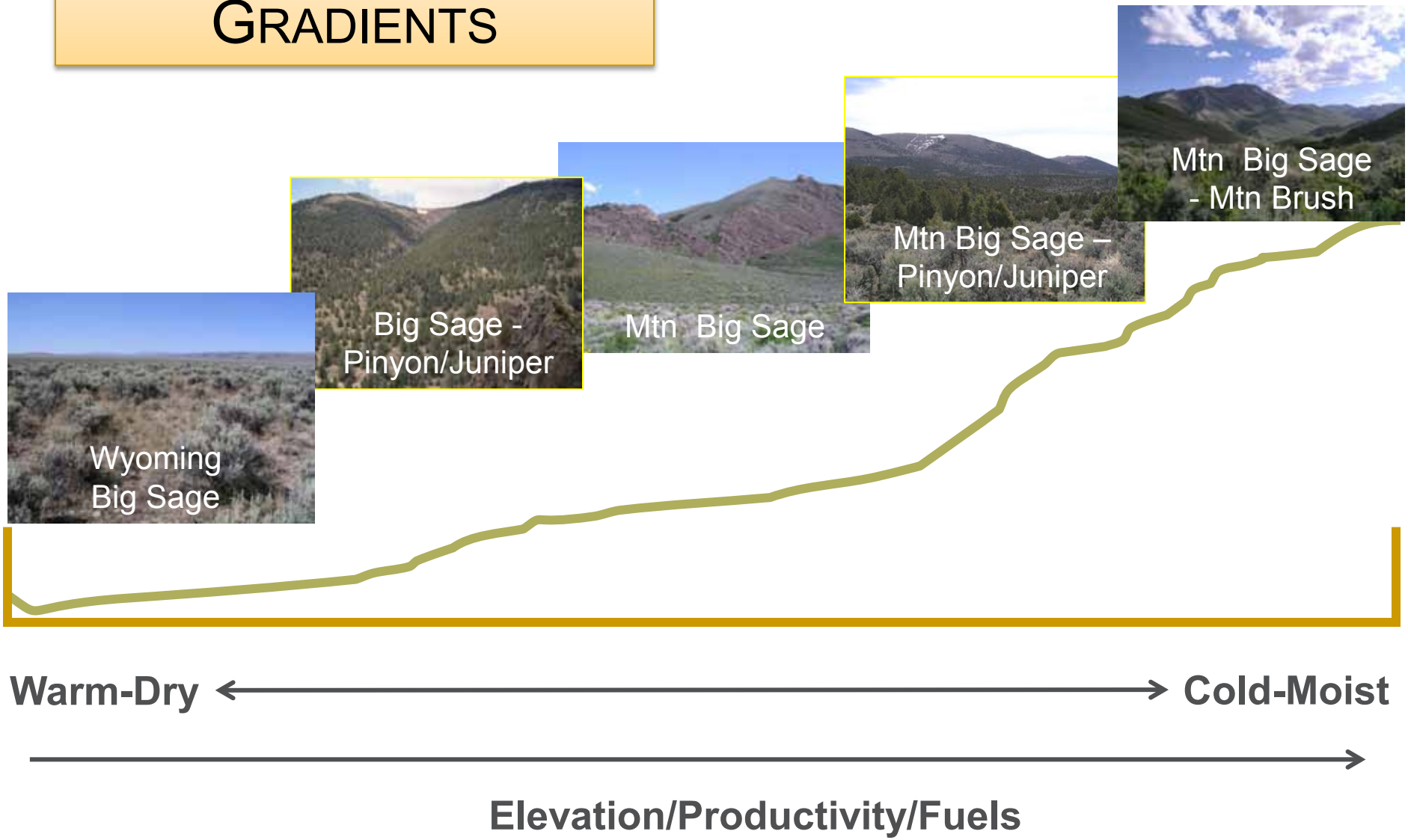
Key element ~ managing for *resilience*

- Broadly distributed and widely ranging species
- Requires large populations in large blocks across full range of habitats
- Strategic multi-scale approach – Landscape to site

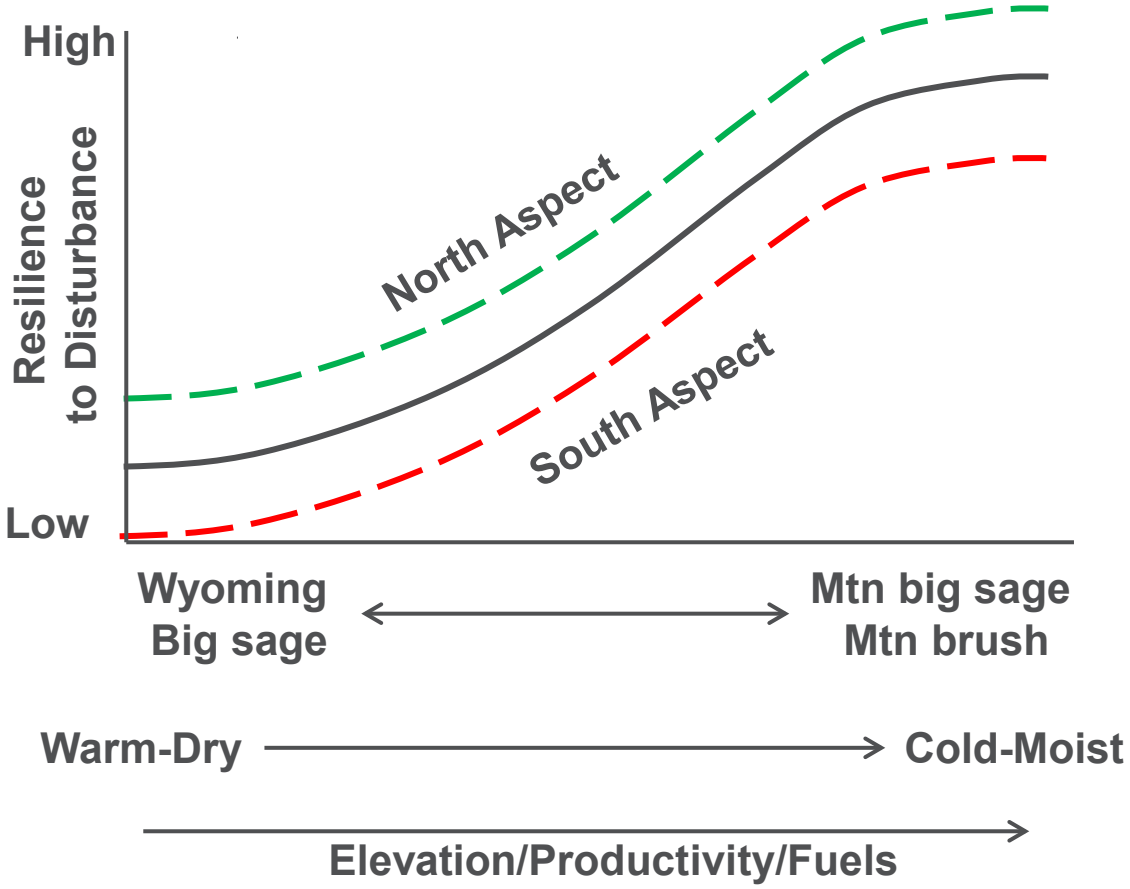
Invasive Species and Wildfire Management Goals

- *Increase resilience of native ecosystems to disturbance*
- *Enhance resistance to invasive species*
  - Maintain amount of landscape sagebrush cover required for sage-grouse
  - Increase perennial herbaceous species
  - Decrease invasive annual grass abundance & spread

Environmental Gradients



Resilience to Disturbance

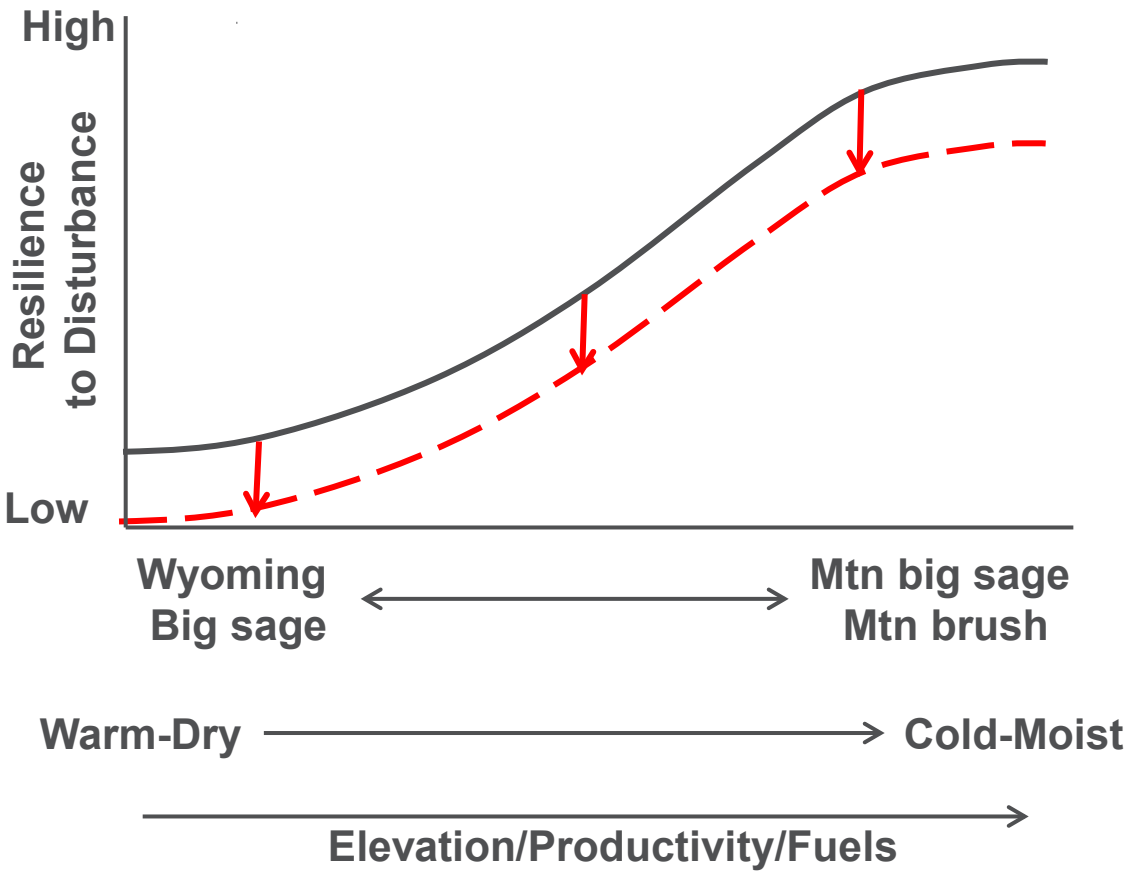


Resilience changes over environmental gradients

- ↑ More favorable growing conditions, higher productivity & fire tolerant species
- • Less change
- • More rapid recovery
- ± Aspect

(Wisdom & Chambers 2009; Brooks and Chambers 2011; Condon et al. 2011; Davies et al. 2012; Chambers et al. 2014a, b; Miller et al. 2014)

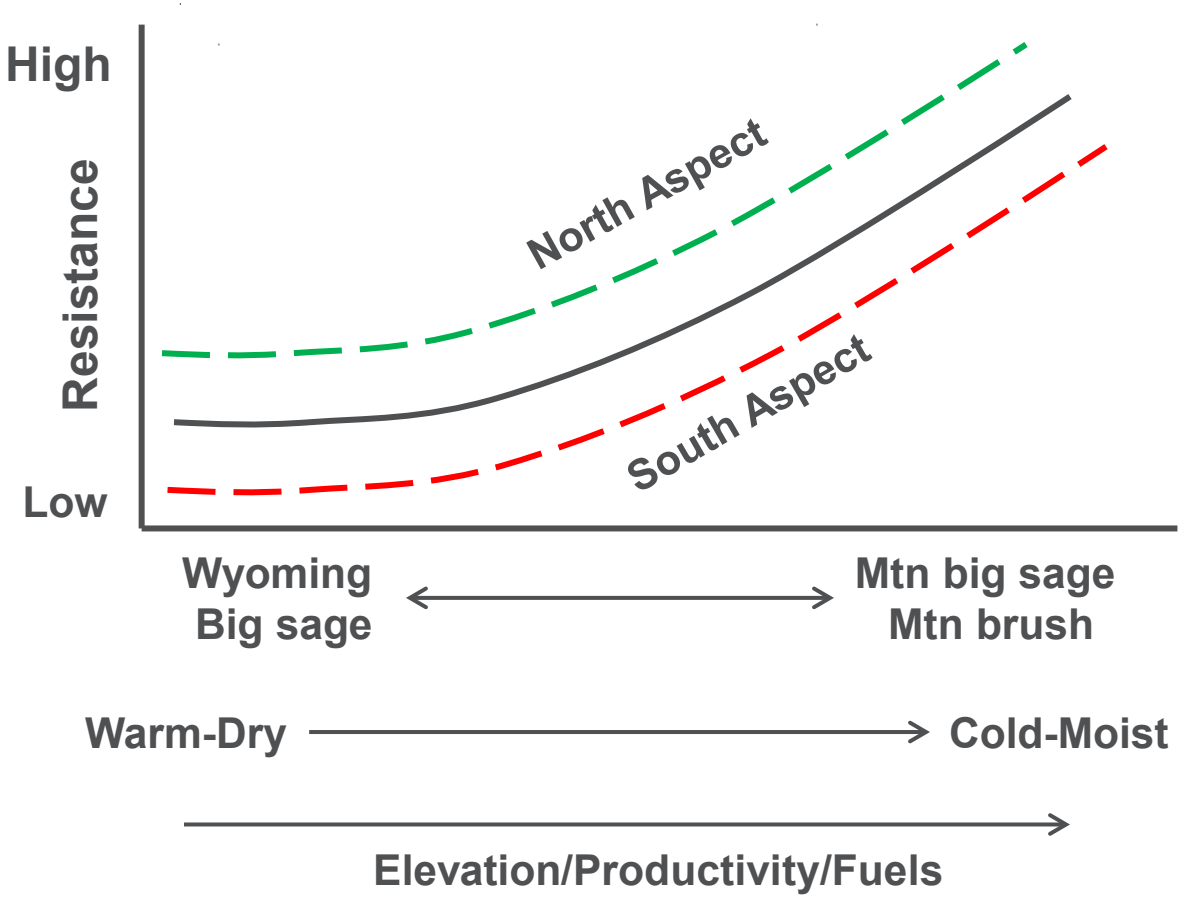
Resilience to Disturbance



Resilience decreases with disturbance/stress outside of natural range of variability

- Changes in vegetation structure or composition
  - ↑ Invasive species
  - ↑ Woody species
- Altered fire regimes

Resistance to Cheatgrass



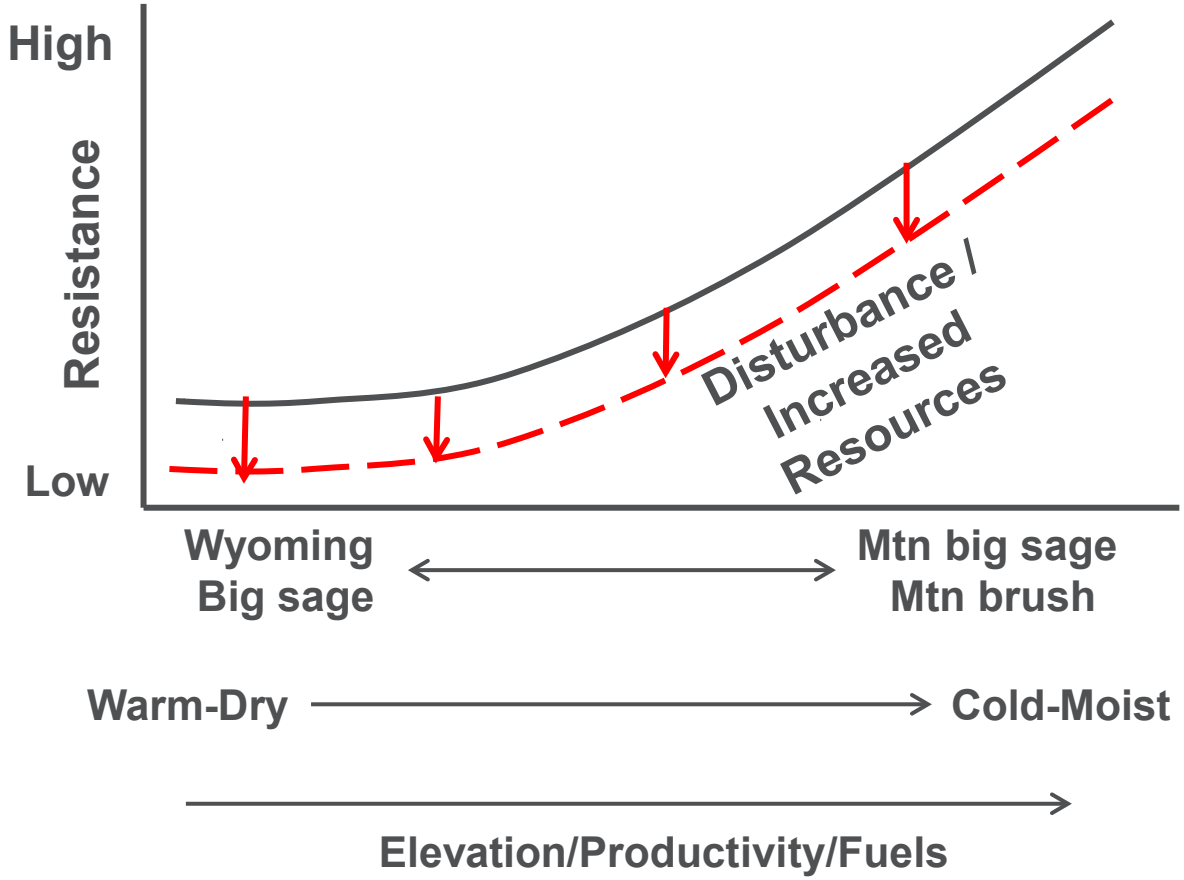
Resistance depends on climate suitability & community attributes

- Lowest – Wyoming sage
- Highest - mountain sage

± Aspect

(Chambers et al. 2007, Condon et al. 2011, Davies et al. 2012)

Resistance to Cheatgrass



(Chambers et al. 2007)

Resistance decreases with disturbance/stress

- Fire, surface disturbance, inappropriate grazing
  - ➢ Increases in soil water & nutrients
  - ➢ Decreased competition
    - Removal – 2 to 3 fold
    - Burning – 2 to 6 fold
    - Removal + Burning –10 to 30 fold

Resistance & Resilience of Ecological Types

Ecological Type	Characteristics	Resilience and resistance
Cold & Moist *Cryic (all)*	Typical shrubs: Mountain big sagebrush, Snowfield sagebrush, snowberry, serviceberry, silver sagebrush, and/or low sagebrushes	Resilience – Moderately high Resistance– High
Cool & Moist *Frigid/Xeric*	Ppt: 12-22” Typical shrubs: Mountain big sagebrush, antelope bitterbrush, snowberry, and/or low sagebrushes Piñon pine and juniper potential in some areas	Resilience – Moderately high Resistance – Moderate
Warm & Moist *Mesic/Xeric*	Ppt: 12-16” Typical shrubs: Wyoming big sagebrush, mountain big sagebrush, Bonneville big sagebrush, and/or low sagebrushes Piñon pine and juniper potential in some areas	Resilience – Moderate Resistance – Moderately low
Cool & Dry *Frigid/Aridic*	Ppt: 6-12” Typical shrubs: Wyoming big sagebrush, black sagebrush, and/or low sagebrushes	Resilience – Low Resistance – Moderate
Warm & Dry *Mesic/Aridic bordering on Xeric*	Ppt: 8-12” Typical shrubs: Wyoming big sagebrush, and or black sagebrush and/or low sagebrushes (large portion of the Great Basin)	Resilience – Low Resistance – Low

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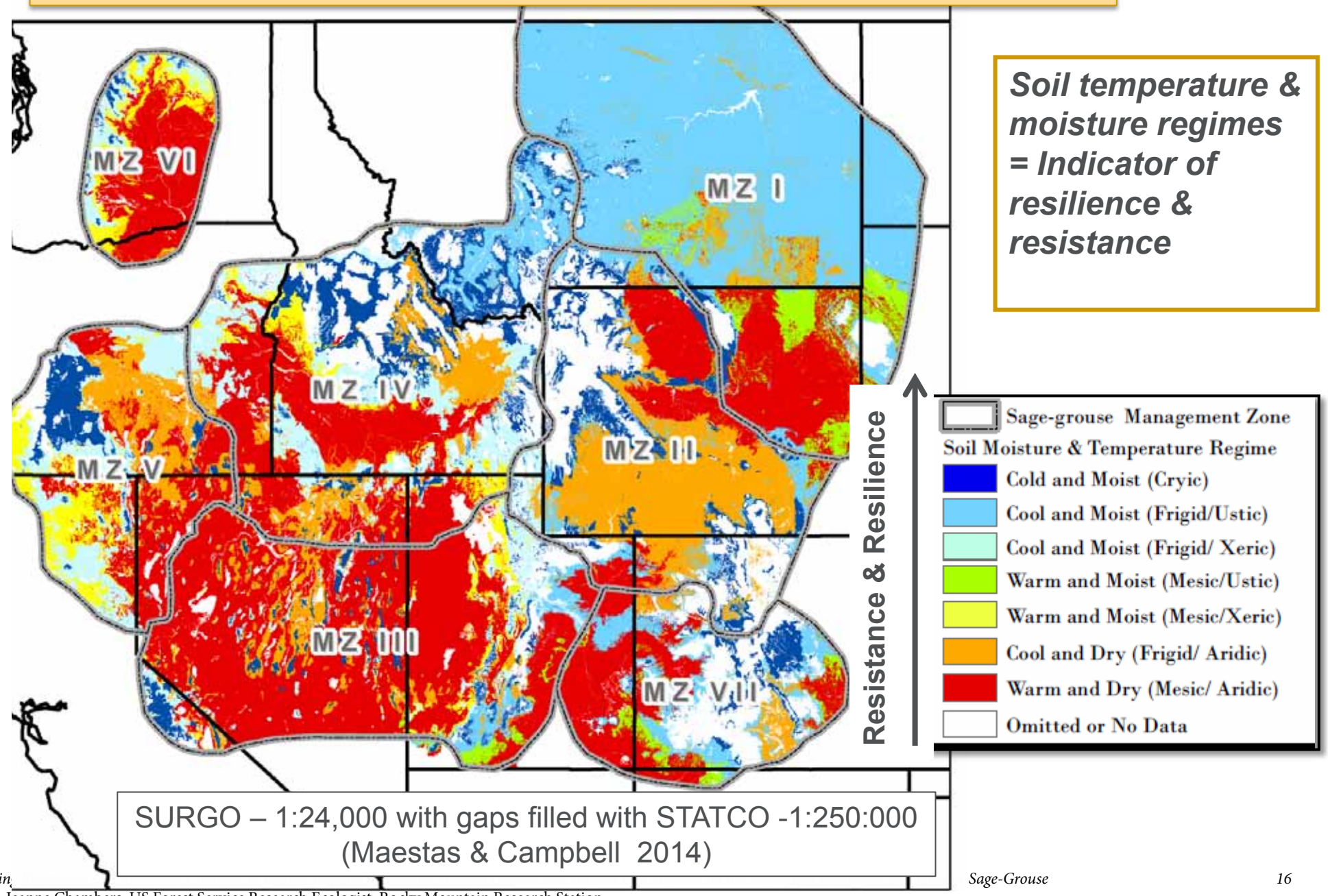
Soil Temperature & Moisture Regimes



Soil temperature & moisture regimes = Indicator of resilience & resistance

SURGO – 1:24,000 with gaps filled with STATCO -1:250:000 (Maestas & Campbell 2014)

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Sage-grouse Habitat Requirements

- ***Landscape cover of sagebrush***
  - High risk of extirpation with < 25% land cover of sagebrush
  - Intermediate probability of persistence with 25 to 65% cover
  - High probability of persistence with > 65% land cover of sagebrush

  (5-30 km radii around leks; Aldridge & Boyce 2007, Knick et al. 2013, Wisdom et al. 2011)

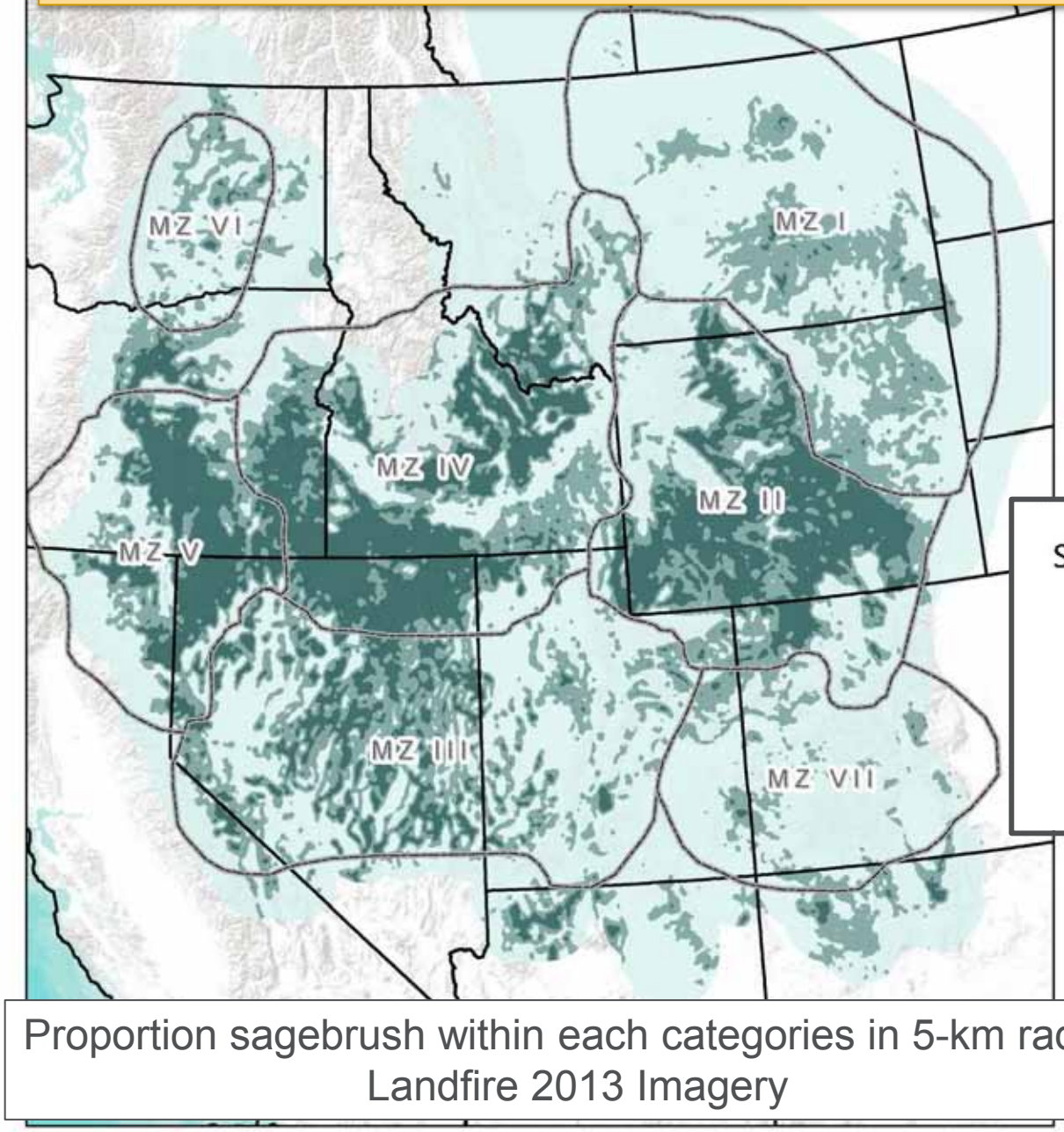
- ***Landscape cover of conifers***
  - Leks average < 1% if conifer cover is present
  - Leks are absent with > 40% conifer cover

  (5-km radii around leks; Knick et al. 2013)

- ***Cover of annual grasses***
  - Nesting areas have < 6 to 8% annual grass

  (Johnson et al. 2011; Kirol et al. 2012; Lockyer et al. in press)

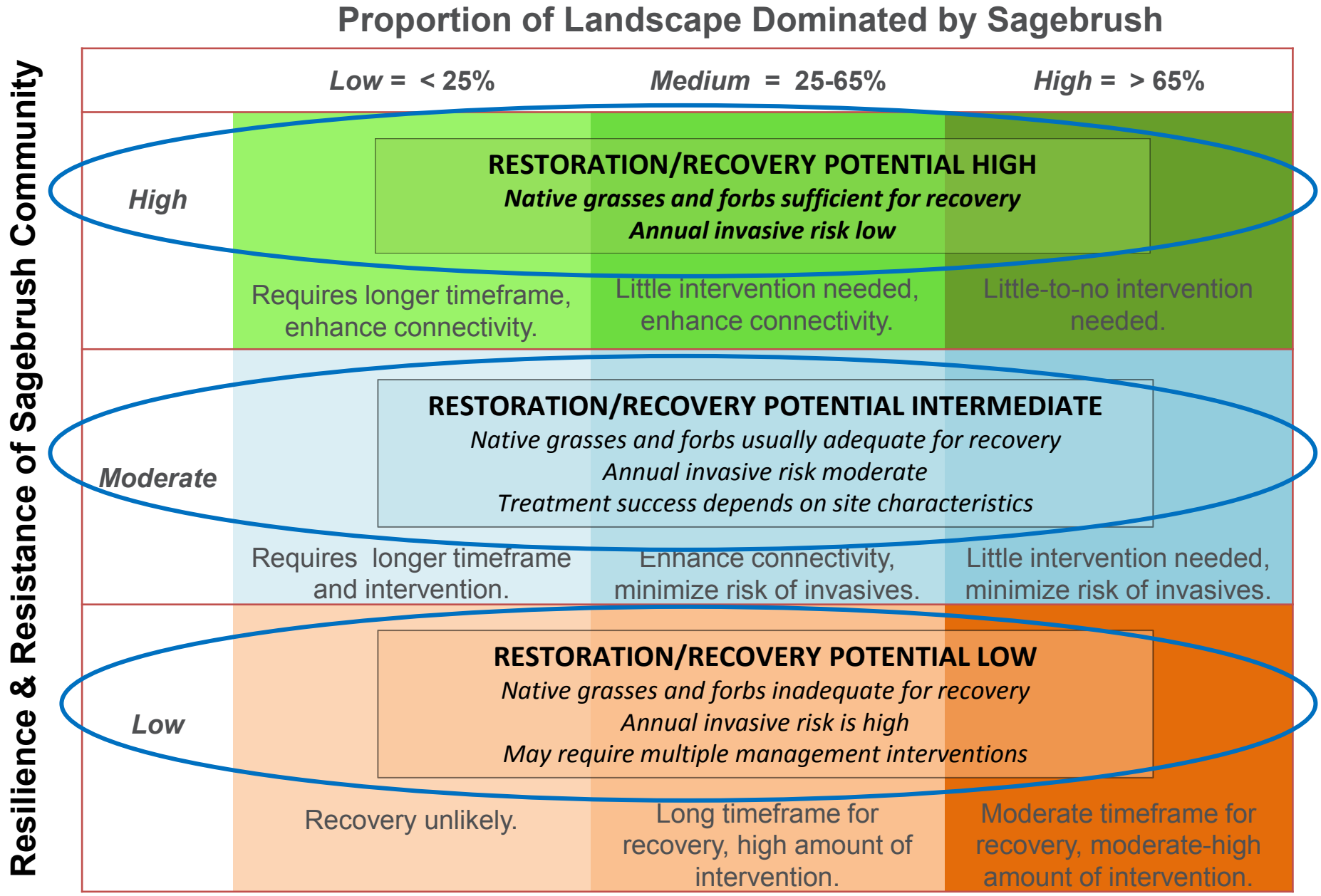
Landscape Cover of Sagebrush



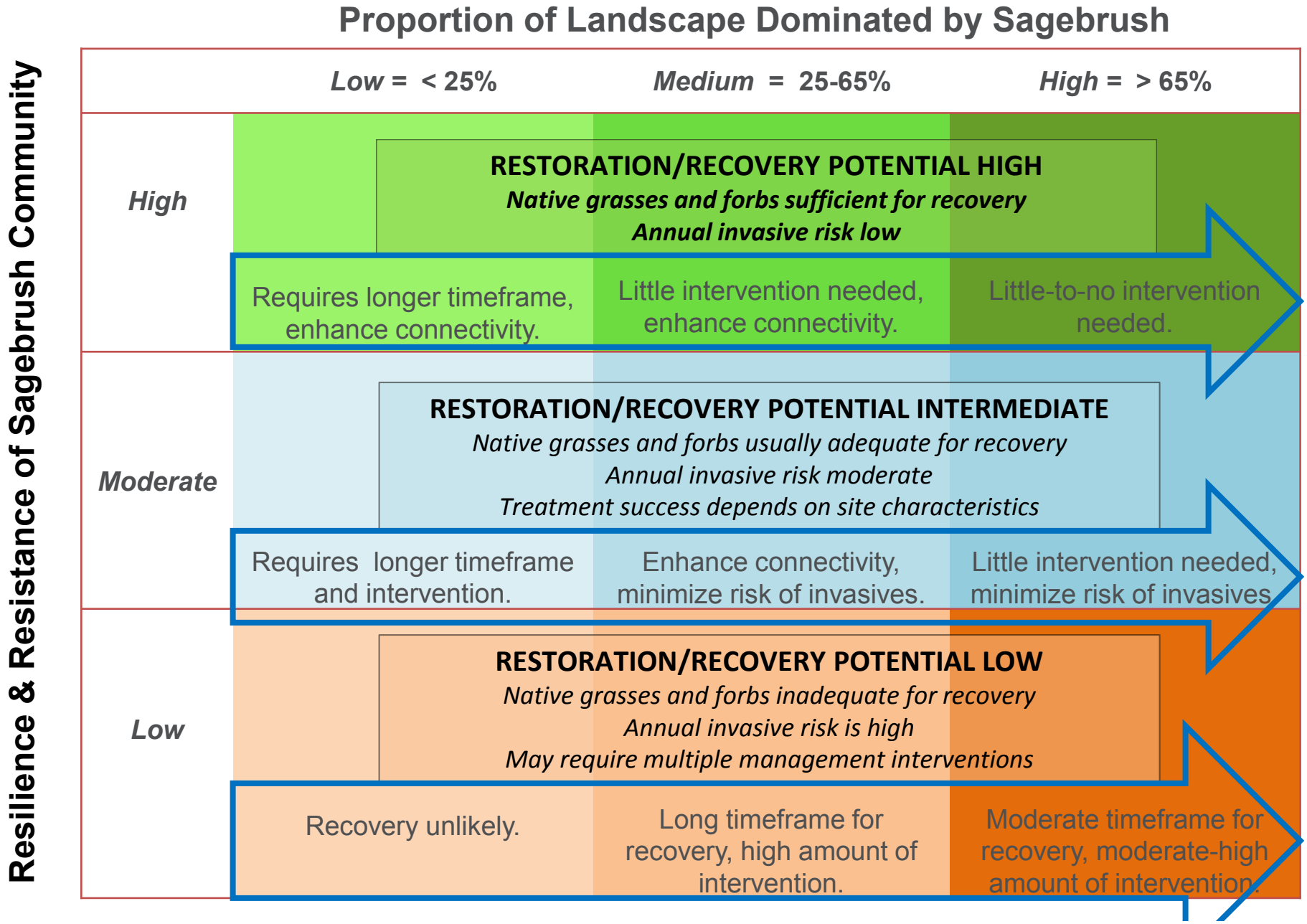
Landscape cover of sagebrush = Indicator of sage-grouse habitat

Proportion sagebrush within each categories in 5-km radius
Landfire 2013 Imagery

SAGE-GROUSE HABITAT MATRIX



SAGE-GROUSE HABITAT MATRIX



Management Strategies

Potential actions organized by management strategies within resilience and resistance categories

- Fire Operations – Preparedness, Prevention and Suppression
- Fuels Management
- Post-fire Rehabilitation
- Habitat Recovery/Restoration

LANDSCAPE PRIORITIZATION

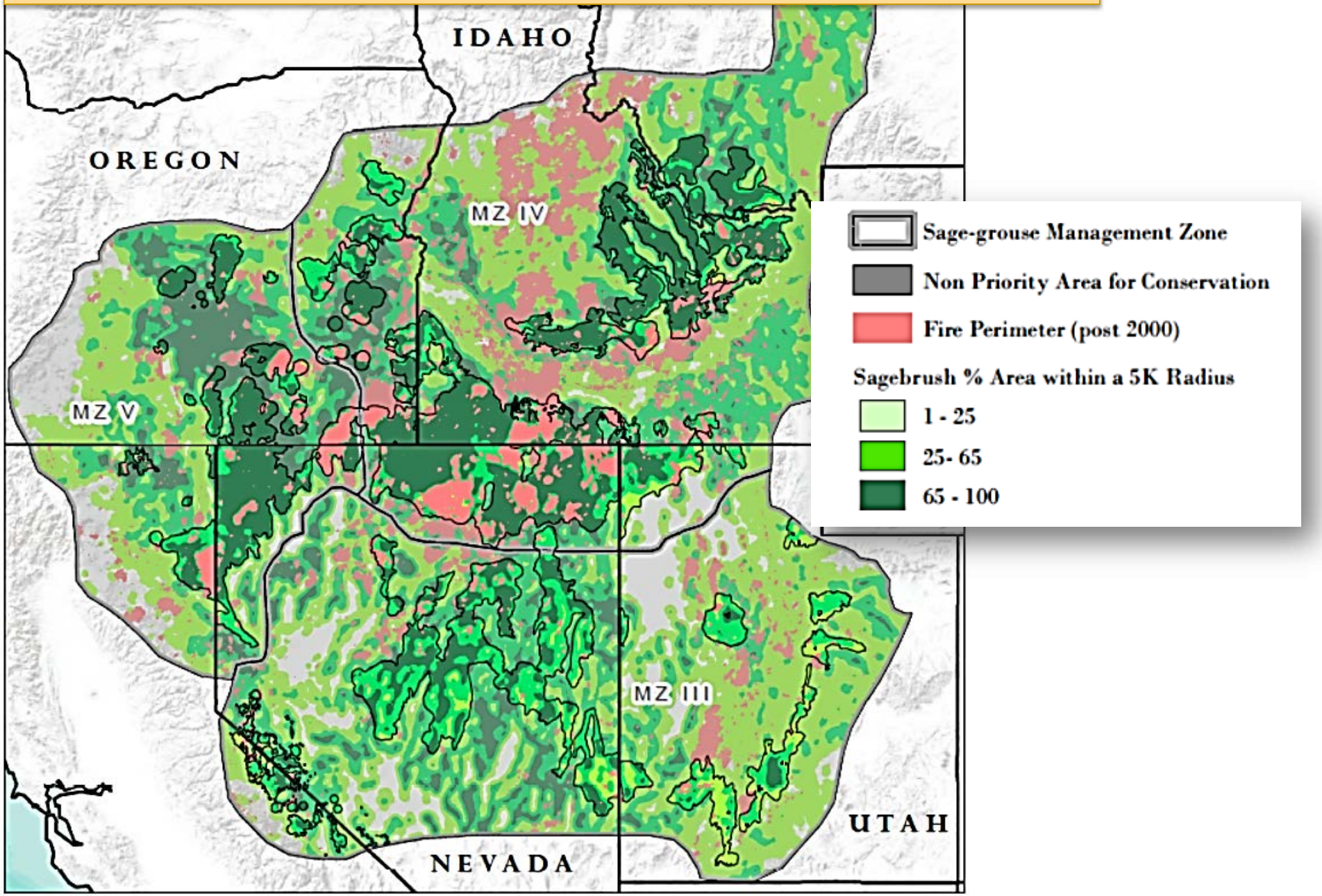
Focal areas for management support viable populations of birds

- Priority Areas for Conservation (PACs)
  - Landscape scale cover of sagebrush
  - Soil temperature/moisture regimes
- Threats
  - Invasive annual grass cover
  - Pinyon and juniper cover

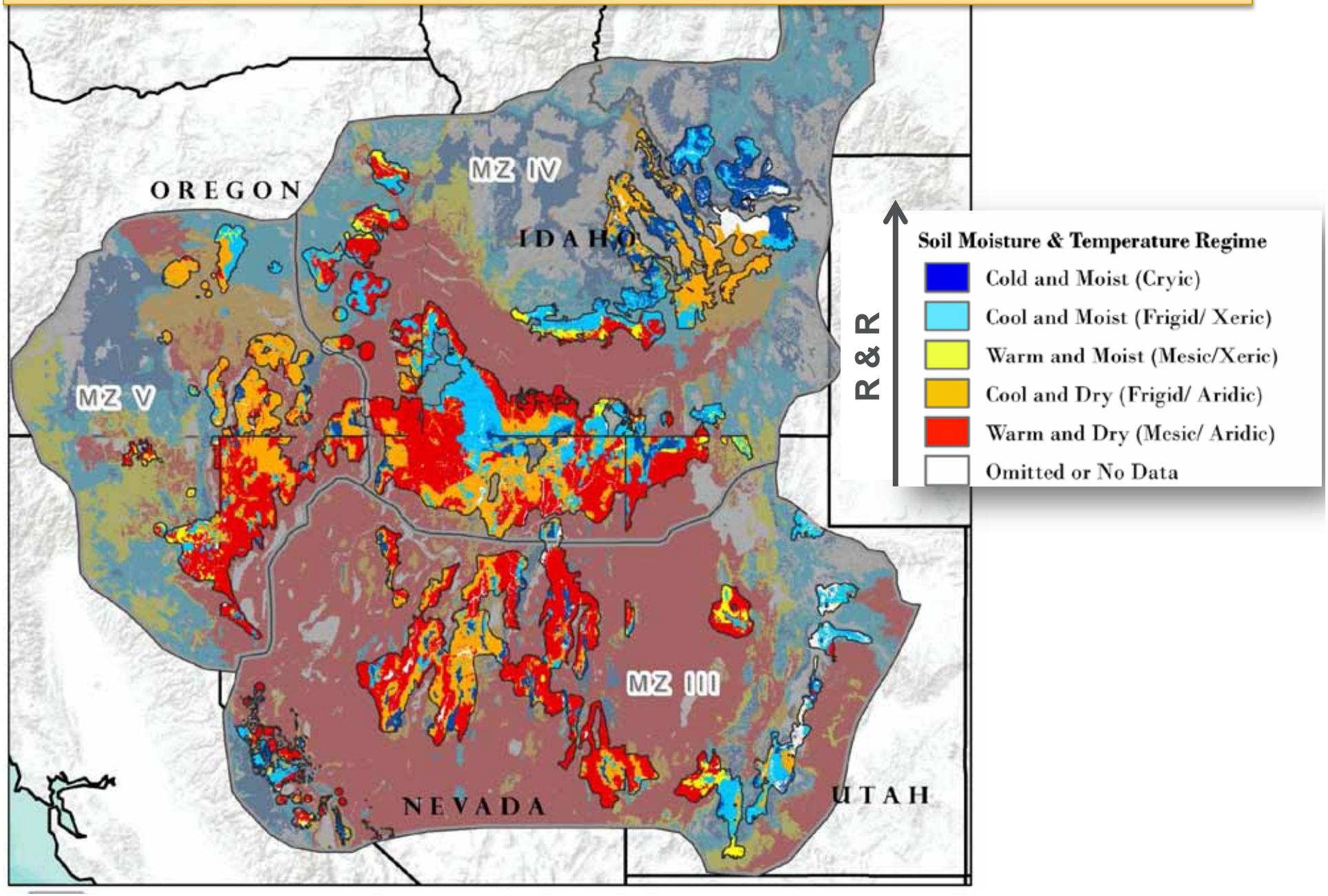
+ Breeding Bird Density – maximum counts of males on leks
  - High density = areas with 75% BBD
    (Doherty et al. 2010)

+ Locally relevant information

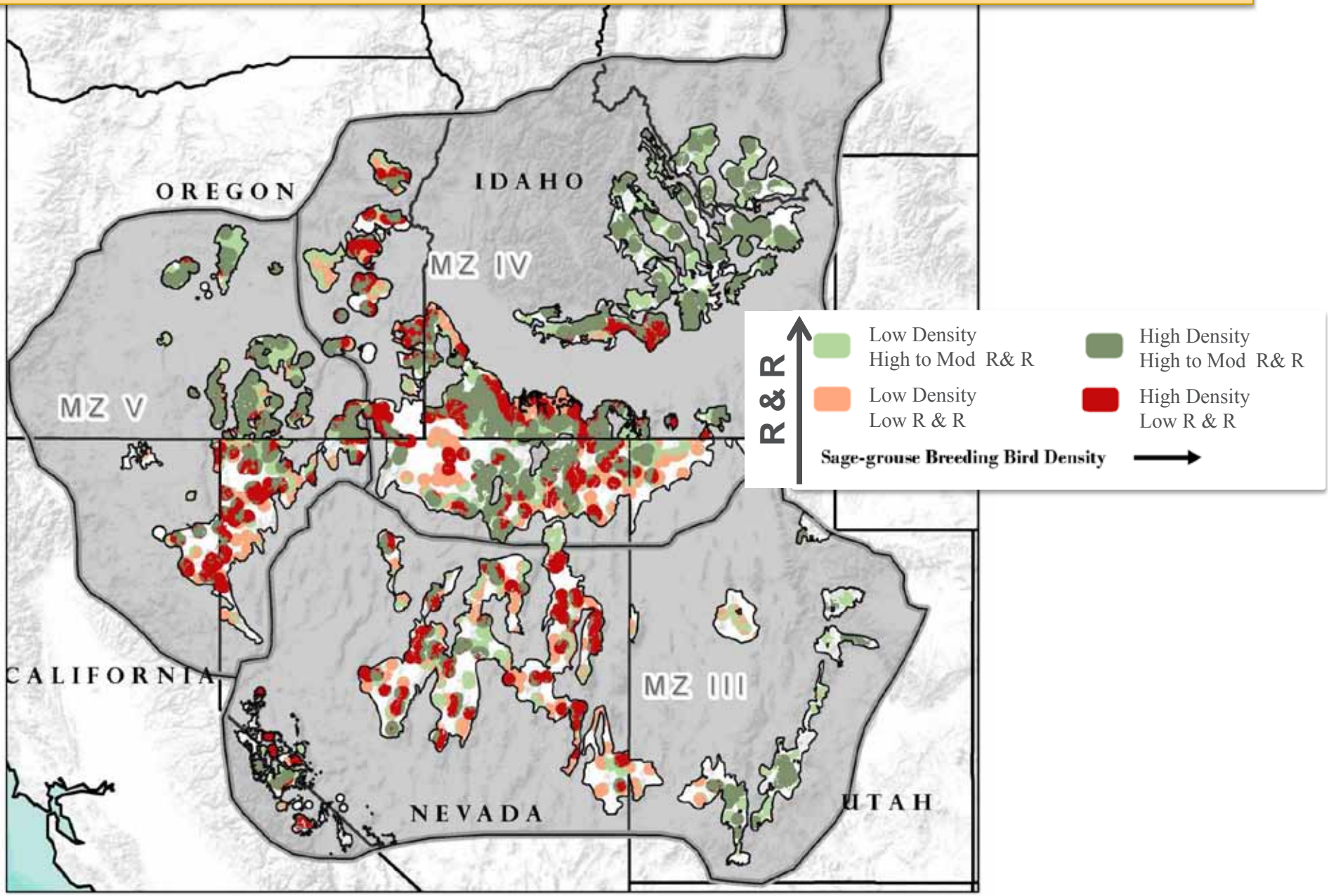
Landscape Cover of Sagebrush in PACs



Soil Temperature & Moisture Regimes in PACs



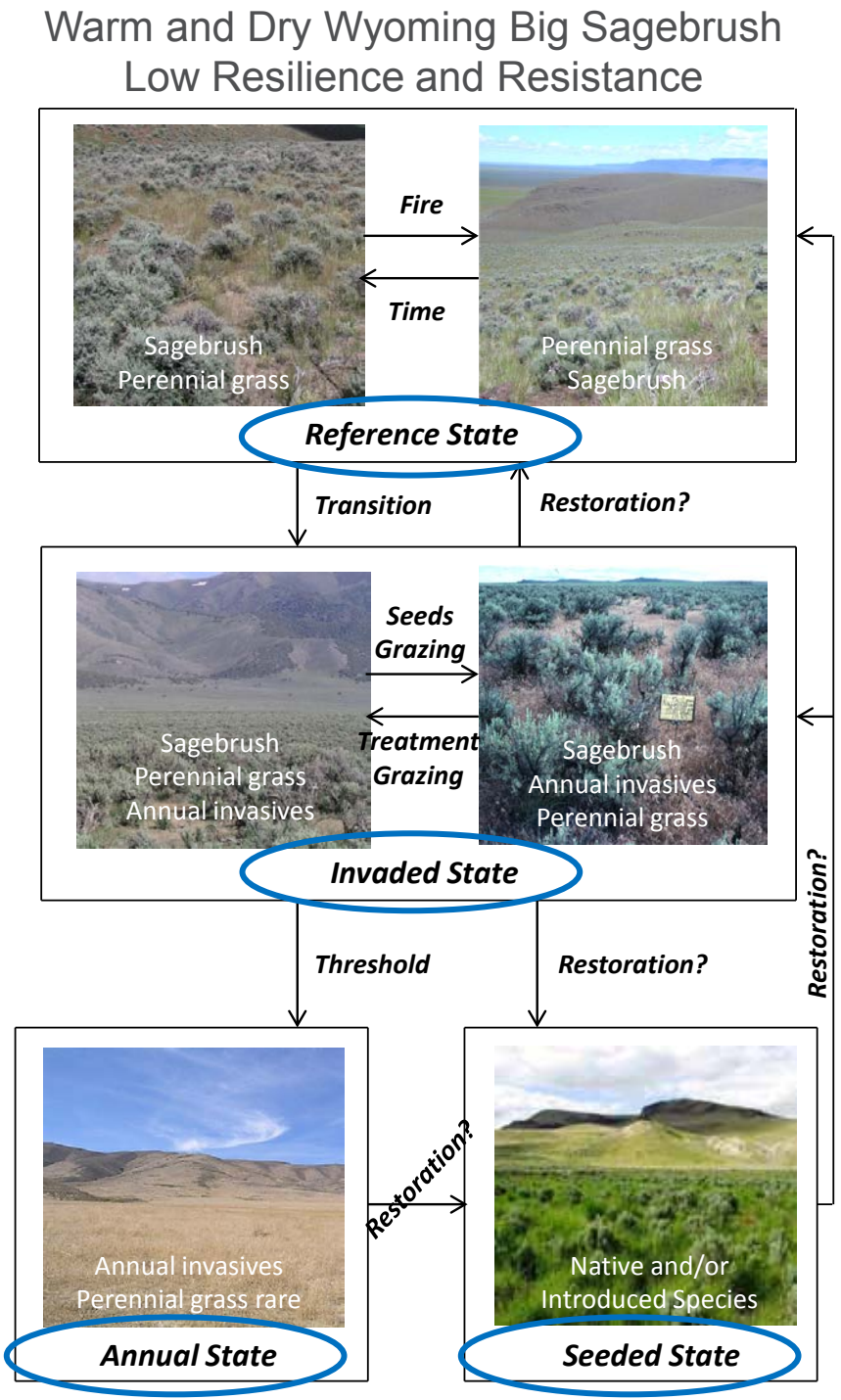
Breeding Bird Densities and R & R



Scaling Down to the Site

Selecting Appropriate Sites and Management Treatments

- Steps in the process
  - Assess potential treatment area and identify ecological sites
  - Determine ecological states and plant communities for the different sites
  - Select appropriate action(s)
  - Monitor to determine post-treatment management



DECISION TOOLS

State & Transition Models that incorporate R & R concepts

- Ecological States
- Plant Communities

➢ Restoration pathways

Chambers et al. 2014

Decision Tools

Field Guides

- Selecting the most appropriate treatments in sagebrush and pinyon-juniper ecosystems **&**
- Evaluating site recovery potential in sagebrush ecosystems after wildfire (Miller, Chambers, & Pellant 2014)
- Restoration of sagebrush-steppe ecosystems with special emphasis on Greater Sage-Grouse habitat (Pyke et al. in progress)